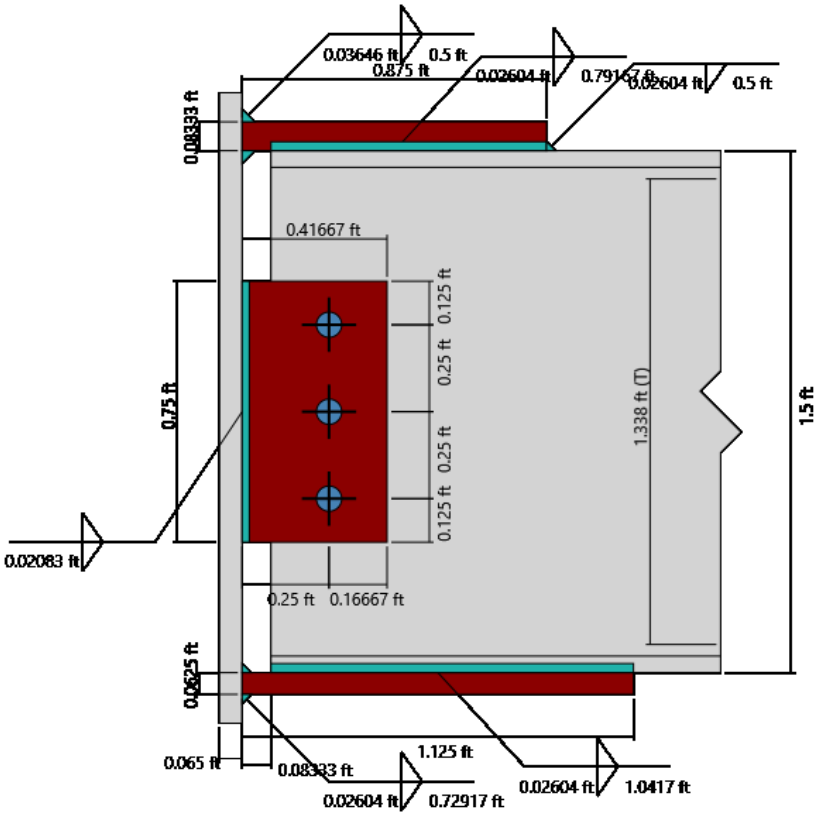
# Design Summary: Welded Flange Plate




**Top Plate Design:**
Length = 0.875 ft
Width = 0.5 ft
Thickness = 0.08333 ft
Fy = 7200 Ksf
Fu = 9360 Ksf

**Top Weld at Support:**
Type = Double Fillet
Fexx = 10080 Ksf
Size = 0.03646 ft
Length = 0.5 ft

**Top Weld at Flange:**
Type = Double Fillet
End Weld? = Yes
Fexx = 10080 Ksf
Size = 0.02604 ft

**Bottom Plate Design:**
Length = 1.125 ft
Width = 0.72917 ft
Thickness = 0.0625 ft
Fy = 7200 Ksf
Fu = 9360 Ksf

**Bottom Weld at Support:**
Type = Double Fillet
Fexx = 10080 Ksf
Size = 0.02604 ft
Length = 0.72917 ft

**Bottom Weld at Flange:**
Type = Double Fillet
End Weld? = No
Fexx = 10080 Ksf
Size = 0.02604 ft

**Shear Tab Design:**
Height = 0.75 ft
Width = 0.41667 ft
Thickness = 0.03125 ft
Fy = 7200 Ksf
Fu = 9360 Ksf

**Shear Tab Weld Design:**
Type = Double Fillet
Fexx = 10080 Ksf
Size = 0.02083 ft
Length = 0.75 ft

**Shear Tab Bolt Design:**
Type = Group 120
Diameter = 0.07292 ft
Thread = N
Spacing = 0.25 ft
Bolt Count = 3

**Support Design:**
Thickness = 0.065 ft
Fy = 7200 Ksf
Fu = 9360 Ksf

**Beam Design:**
d = 1.5 ft
T = 1.338 ft
bf = 0.625 ft
tf = 0.0475 ft
tw = 0.02958 ft
Fy = 7200 Ksf
Fu = 9360 Ksf

**Steel Specification:**
AISC 360-22

| Limit State | Load Key | Demand | Capacity | Unity Value |
|---|---|---|---|---|
| **Shear Tab** | | | | |
| Bolt Group Capacity | 1 | 42 K | 71.33 K | 0.589 |
| Bolt Group Capacity - Beam Web | 1 | 42 K | 73.06 K | 0.575 |
| Fillet Weld | 1 | 42 K | 100.23 K | 0.419 |
| Base Metal | 1 | 42 K | 98.719 K | 0.425 |
| Base Metal - Support | 1 | 42 K | 410.67 K | 0.102 |
| Block Shear | 1 | 42 K | 82.266 K | 0.511 |
| Shear Yield | 1 | 42 K | 101.25 K | 0.415 |
| Shear Rupture | 1 | 42 K | 65.813 K | 0.638 |
| **Top Flange Plate** | | | | |
| Tension Yield | 1 | 175 K | 270 K | 0.648 |
| Tension Rupture | 1 | 175 K | 292.5 K | 0.598 |
| Compression Buckling | - | - | - | - |
| Block Shear | - | - | - | - |
| Fillet Weld - Plate to Flange | 1 | 175 K | 175.06 K | 1.000 |
| Base Metal | 1 | 175 K | 735.64 K | 0.238 |
| Base Metal - Flange | 1 | 175 K | 419.31 K | 0.417 |
| Weld - Plate to Support | 1 | 175 K | 175.41 K | 0.998 |
| Base Metal - Plate to Support | 1 | 175 K | 270 K | 0.648 |
| **Bottom Flange Plate** | | | | |
| Tension Yield | - | - | - | - |
| Tension Rupture | - | - | - | - |
| Compression Buckling | 1 | 175 K | 295.12 K | 0.593 |
| Block Shear | - | - | - | - |
| Fillet Weld - Plate to Flange | 1 | 175 K | 174.01 K | 1.006 |
| Base Metal | 1 | 175 K | 548.44 K | 0.319 |
| Base Metal - Flange | 1 | 175 K | 416.81 K | 0.420 |
| Weld - Plate to Support | 1 | 175 K | 182.72 K | 0.958 |
| Base Metal - Plate to Support | 1 | 175 K | 399.26 K | 0.438 |
| **Welded Flange Plate Detailing** | - | - | - | OK |

# Welded Flange Plate: Detailed Reports

## Tension Yield - Top Plate (AISC 360-22 J4.1.a)

Load Set: Load Set 1 Load Combination: 1.2D + 1.6L
Demand: Ru = 175 K
Capacity: ϕRn = ϕ·Fy·l·t·n = 0.90 · 7200 Ksf · 0.5 ft · 0.08333 ft · 1
ϕRn = 270 K
Unity = Ru / ϕRn = 175 K / 270 K = **0.648**

## Fillet Weld - Top Plate to Flange (AISC 360-22 J2.4)

Load Set: Load Set 1  Load Combination: 1.2D + 1.6L
Demand:  Ru = 175 K
Weld:  Size = 0.02604 ft  Fexx = 10080 Ksf
  Longitudinal Length = 0.79167 ft  Transverse Length = 0.5 ft
  Rn_wl = 176.33 K  Rn_wt = 55.685 K  Weld Unit Capacity = 111.37 K/ft
  ϕRn = Phi · Max(Rn_wl + Rn_wt, 0.85·Rnwl + 1.5·Rnwt) (Equation J2-6)
  ϕRn = Phi · Max(176.33 K + 55.685 K, 0.85·176.33 K + 1.5·55.685 K)
  ϕRn = 175.06 K (Equation J2-6)
Unity = Ru / ϕRn = 175 K / 175.06 K = **1.000**

## Weld - Top Plate to Support (AISC 360-22 J2.4)

Load Set: Load Set 1  Load Combination: 1.2D + 1.6L
Demand:  Ru = 175 K
Fillet Weld: Size = 0.03646 ft  Fexx = 10080 Ksf  Weld Length = 0.5 ft  Theta = 90 deg
  Weld Line Count = 2  Weld Unit Capacity = 233.88 K/ft
  ϕRn = Phi · 0.6 · Fexx · (1.0 + 0.5 · sin(Theta)^1.5) (Equation J2-4)
  ϕRn = 0.75 · 0.6 · 10080 Ksf · (1.0 + 0.5 · sin(90 deg)^1.5)
  ϕRn = 175.41 K
Unity = Ru / ϕRn = 175 K / 175.41 K = **0.998**

## Base Metal - Top Plate to Support (AISC Part 9 & 360-22 J2.4)

Load Set: Load Set 1  Load Combination: 1.2D + 1.6L
Demand: Ru = 175 K (Tension)
Weld: Weld Length = 0.5 ft

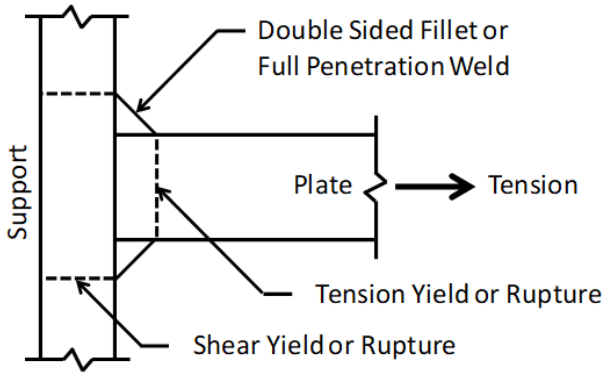



Plate: Fy = 7200 Ksf  Fu = 9360 Ksf  t = 0.08333 ft
  Tensile Yield: ϕRn_ty = 0.9·Fy·t·WeldLength = 270 K (Equation J4-1)
  Tensile Rupture: ϕRn_tr = 0.75·Fu·t·WeldLength = 292.5 K (Equation J4-2)
  Capacity: ϕRn1 = Min(ϕRn_ty, ϕRn_tr) = 270 K
Support: Fy = 7200 Ksf  Fu = 9360 Ksf  t = 0.065 ft
  Shear Yield: ϕRn_vy = 1.0·0.6·Fy·t·Weld Length·2 = 280.8 K (Equation J4-3)
  Shear Rupture: ϕRn_vr = 0.75·0.6·Fu·t·Weld Length·2 = 273.78 K (Equation J4-4)
  Capacity: ϕRn2 = Min(ϕRn_vy, ϕRn_vr) = 273.78 K
Unity = Ru / Min(ϕRn1, ϕRn2) = 175 K / 270 K = **0.648**

### Compression Buckling - Bottom Plate (AISC 360-22 E3)

Load Set: Load Set 1  Load Combination: 1.2D + 1.6L
Demand: Ru = 175 K
Plate: Fy = 7200 Ksf  Thickness = 0.0625 ft  Ag = 0.04557 ft^2  K = 0.65  L = 0.08333 ft  r = 0.01804 ft  n = 1
Capacity:
KL/r = 3.002  Fe = 4572722 Ksf (Equation E3-4)  Fcr = 7195.3 Ksf (Equation E3-2)
ϕRn = ϕ·Ag·Fcr·n = 0.90 · 0.04557 ft^2 · 7195.3 Ksf · 1 = 295.12 K
Unity = 175 K / 295.12 K = **0.593**

# Load Combinations

| Code | Name | Effective Equation |
|---|---|---|
| ASCE 7-22 LRFD | 1. 1.4D | 1.4D |
| ASCE 7-22 LRFD | 2. 1.2D+1.6L+0.5Lr | 1.2D + 1.6L |
| ASCE 7-22 LRFD | 3. 1.2D+1.6Lr+L | 1.2D + 0.5L |

# Design Loads

| Load Key | Fvu (K) | Fau (K) | Mzu (K-ft) |
|---|---|---|---|
| 0 | -9.8 | 0 | -58.8 |
| 1 | -42 | 0 | -252 |
| 2 | -18.9 | 0 | -113.4 |